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the earthquake in the case in question was not progressive at all, but that it was produced by some force within the earth, acting outward.

Professor ANDREWS stated that he had observed the earthquake at Columbus, Ohio, and was struck by the fact that the motion, instead of being a sudden shock or jar, as is commonly the case, was like the gentle undulation of a boat in the water. He thought if the earthquake had been the result of a sudden explosion directly beneath, there would have been a sudden jar instead of this undulatory motion. It might possibly be accounted for by the fact that there is a blanket of drift material from eighty to one hundred feet in thickness underlying Columbus, which might serve to break the force of the concussion.

Professor WINCHELL thought the suggestion of Professor Andrews would be applicable to the phenomena in connection with this earthquake, if those phenomena had not had an existence over so wide an area. It seemed incredible that anything like an earthquake wave should have been transmitted from any superficial location along the earth's surface with anything like the rapidity that was indicated.

There must have been a deep-seated force exerted, the results of which reached the surface at remote points nearly at the same time. It would seem to indicate that the seat of earthquake activities is at some point within the earth, far removed from its surface. He thought evidence might possibly be found in this phenomenon, tending to corroborate the theory of some geologists in reference to the fluid condition of the earth's interior, and the comparative thinness of the solid crust upon which the mountains have been reared.

ON THE EXTINCT TORTOISES OF THE CRETACEOUS OF NEW JERSEY.

BY PROFESSOR E. D. COPE.

His object was to explain two cases of "generalized groups," such as are not common, comparatively speaking, and are of much importance in the history of life. Generalized or synthetic groups of naturalists were explained to be those which combined the characters of others. They were generally found in earlier geologic time, while the more widely differing groups occurred later in time. The cases were as follows. It was explained that the existing division of the marine turtles (*Chelonidæ*) possess sternal bones united by but few sutures, or with wide intervals; straight humerus and femur, and flat limbs, with truncate finger-bones incapable of flexion. It was shown that the existing snapping tortoises possess a narrow cross-shaped sternum with the bones everywhere united to each other, the femur and humerus curved, and the toes with hinge-jointed phalanges capable of much flexion. It was then pointed out that in the New Jersey Green

sand a type of turtles is found, embracing several genera and species, in which the sternum has the elements generally united by sutures, except two central fontanelles, being thus intermediate between that of the *Cheloniidæ* and that of the Chelydras (snappers); that the femur and humerus are curved, as in the snappers, but the limbs are oar-like bodies with truncate phalanges, as in the sea-turtles. This family he called the *Propleuridæ*.

The second case was presented by tortoises of a character like those now inhabiting fresh waters. The *Emydidæ*, or common river tortoises of the northern hemisphere, were shown to possess ten horny shields on the plastron (or lower shell), had a pelvis freely suspended from the carapace (upper shell), and a series of cervical vertebræ which can be curved in an S, and the head thereby drawn into the shell in a vertical plane. The southern hemisphere division of the *Pleurodira*, possesses eleven scuta of the plastron, a pelvis, of which the pubis and ischium unite by sutures with two corresponding elevations of the plastron, and a neck which can not be sigmoidally flexed, but is thrown round to one side, like that of a bird, when it is necessary to conceal the head.

It was shown that in the Cretaceous of New Jersey there existed a family (the *Adocidæ*) which combined the features of these groups. It had eleven scuta of the plastron (the extra one being large and anterior), but the lower bones of the pelvis were not coössified with the plastron, though the latter rose in two corresponding elevations. The latter were evidently rudiments of the articulating knobs of the *Pleurodira*.

Professor Cope stated, moreover, that the *Adocidæ* possessed a row of scuta across "the bridge," within the marginal row, such as existed in modern times in the sea-turtle, and in the Mississippi snapper, thus adding very much to the generalized character of the *Adocidæ*.

Turning to the tortoises of the Eocene beds of Fort Bridger, Wyoming, he showed that these were true *Emydidæ*, but that many of them retained the inter-marginal series of scutes, above-mentioned (*Baptemys*, etc.), so far resembling the *Adocidæ*. Among existing typical *Emydidæ*, but one genus presents the character, viz., the *Dermatemys* of Mexico.

The value of these generalized groups was pointed out as consisting in their correction of our views derived from the great

constancy of specific characters. These, he showed, remained unaltered throughout great extents of time and space, and other slight structural characters endured through many geologic ages. Hence the value of cases where the association of characters is evidently in a transitional condition.

THE EMBRYOLOGY OF CHRYSOPA, AND ITS BEARINGS ON THE CLASSIFICATION OF THE NEUROPTERA.—BY A. S. PACKARD, JR., M.D.

IN a paper presented at the Burlington meeting of the Association in 1867, I gave a brief sketch of the embryology of *Diplax*, especially in the later stages. Those observations, with the far more carefully elaborated studies of Brandt* on *Calopteryx*, another member of the family *Libellulidæ*, have made us acquainted with the embryology of the type of one important division of Neuroptera, and now I have to offer a partial history of *Chrysopa*, the representative of another important division of the group. I did not observe the formation of the blastoderm, but the blastodermic skin ("amion") of *Chrysopa*, is of the same structure as in *Calopteryx*. At the posterior end of the egg the round nucleated cells are crowded together in the same way as in *Calopteryx*. The primitive band is of the same general form, and floats in the yolk as in *Calopteryx*, but more as in *Aspidiotus*, though it rests more on the outside of the yolk than in those genera, and the end of the abdomen rests on the outside of the yolk, rather than rolled in within the yolk; but that the germ is an endoblast (so far as that condition has any special significance) is shown by the fact that the ventral side of the primitive band points inwards towards the centre of the yolk, as in the *Libellulidæ*, the *Hemiptera*, and some *Coleoptera* (*Telephorus* and *Donacia*) in contradistinction to the *Phryganeidæ* and the *Poduræ* (*Isotoma*) in which the germ or primitive band floats entirely on the outside of the yolk. After the procephalic lobes and rudiments of the appendages of the head and thorax have begun to develop, a second moult (visceral layer) of the blastoderm is made, which envelops the head and under side of the body much as in the *Libellulidæ* and *Hemiptera*. At this time the embryo is much like that of the last named insects. The germ does not revolve in the egg, as

*Beiträge zur Entwicklungsgeschichte der Libelluliden und Hemipteren. St. Petersburg. 1869.